(Systems) Cantilever Frames.

نسألكم الدعاء

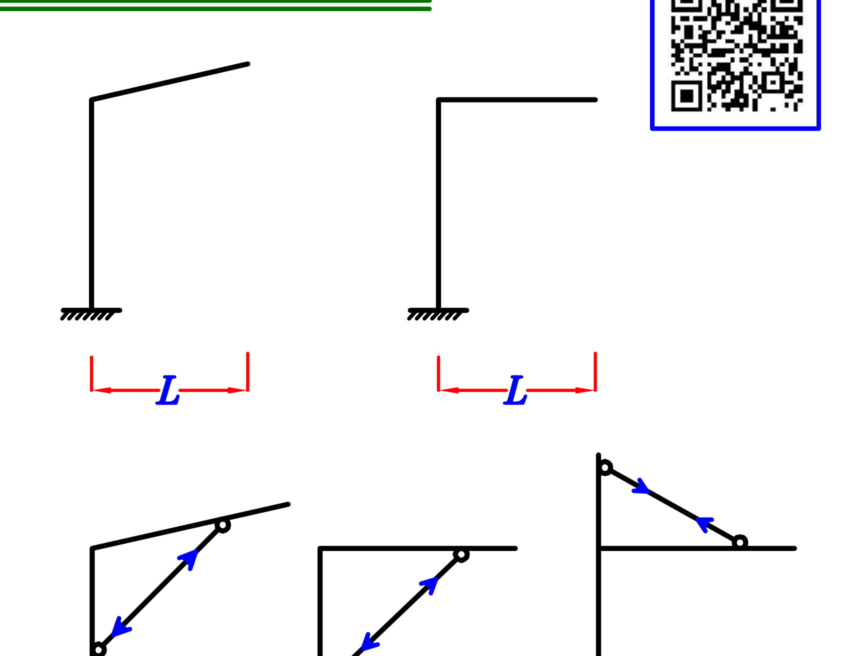
IF you download the Free **APP.** RC Structures YASSER EL LEATHY on your smart phone or tablet, you will be able to play illustrative movies For any paragraph that has a QR code icon

اذا حملت تطبيق RC Structures YASSER EL LEATHY على تليفونك المحمول او اللوح السطحى ستستطيع أن تشغل أفلام شرح للمقاطع التى تحتوى على رمز

Cantilever Frames. Table of Contents.

Types of Cantilever Frames.

Cantilever Frames.



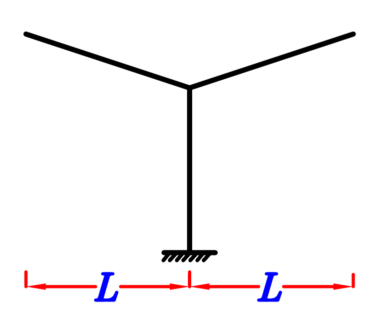
- $L = (3 \longrightarrow 6)\,m$
- IF $L = (6.0 \rightarrow 7.5)\,m$

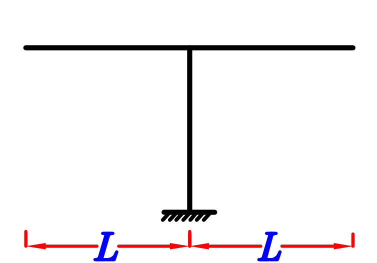
Use Cantilever Frame with span 6.0 m + Cantilever slab with length 1.5 m

- IF $L > 7.5\ m$

Use Tie or Post

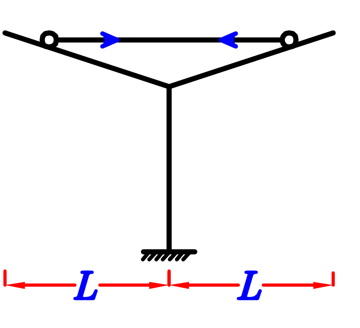
Double Cantilever Frames.

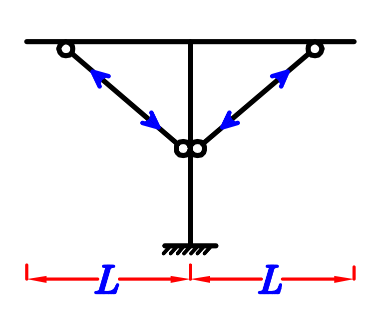




- $L = (3 \longrightarrow 6)\,m$
- IF $L = (6.0 \rightarrow 7.5)\,m$

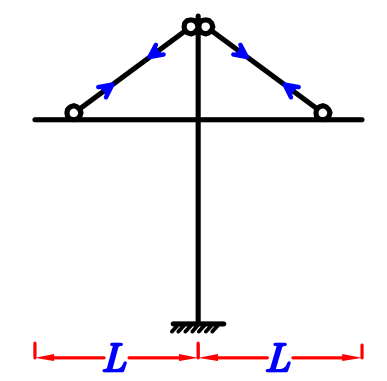
Use Cantilever Frame with span 6.0 m + Cantilever slab with length 1.5 m

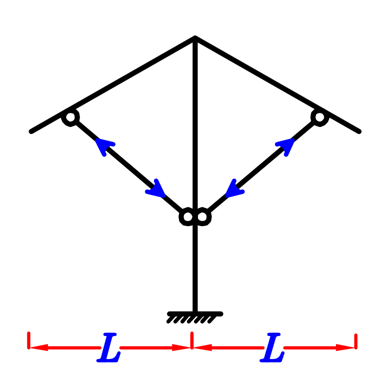




- IF $L > 7.5\ m$

Use Tie or Post





Concrete Dimensions.

- Statical System

T.L.

N_1 N_2 N.F.D.

M ② ① B.M.D.

$t \simeq \frac{L_c}{5}$

$(0.8 \rightarrow 1.0)\,t$

H

ترحل القواعد للداخل

مسافة (e)

القواعد كبيره لمنع

ال Over Turning

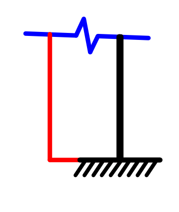
e

$L_c = (3 \rightarrow 6)\,m$

$(1 \rightarrow 1.5)\,m$

– Concrete Dimensions.

* Span (L) = $(3.0 \rightarrow 6.0)$ m ----- Horizontal Beam.
* Span (L) = $(3.0 \rightarrow 8.0)$ m ----- Inclined Beam
* $t \simeq \frac{L_c}{5}$
* $Y = \left\{ \frac{t}{2},\ t_b \right\}$ الأكبر
* $b = \left\{ 0.30\ m,\ \frac{Spacing}{20} \right\}$ الأكبر

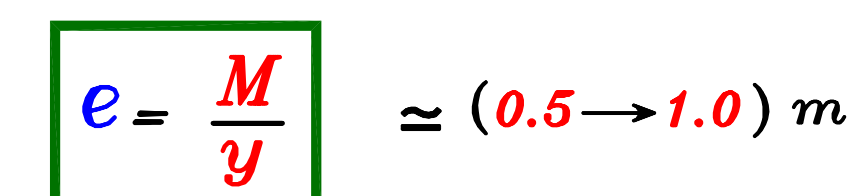


ترحل القواعد عكس اتجاه ال moment مسافه (e)

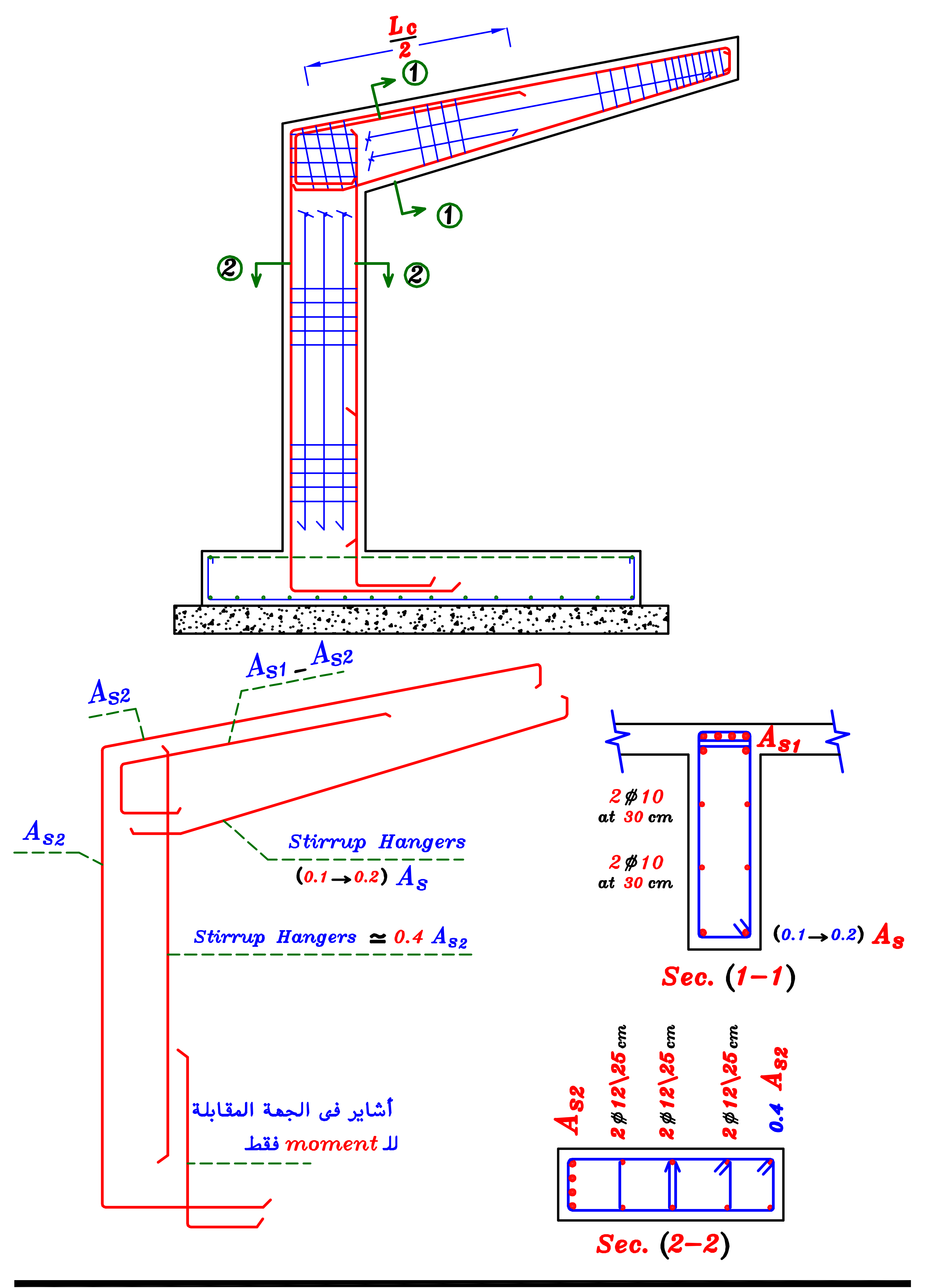
لعمل uniform stress على التربة

M y C.G. e

$\because \sum M_{C.G.} = Zero \qquad \therefore M - y\,(e) = Zero$



$$\therefore \boxed{e = \frac{M}{y}} \simeq (0.5 \rightarrow 1.0)\ m$$



Lc/2
1
1
2
2
As1 _ As2
As2
As2
Stirrup Hangers
(0.1 → 0.2) As
Stirrup Hangers ≃ 0.4 As2
أشاير فى الجهة المقابلة
لل moment فقط
As1
2 ϕ 10
at 30 cm
2 ϕ 10
at 30 cm
(0.1 → 0.2) As
Sec. (1-1)
As2
2 ϕ 12\25 cm
2 ϕ 12\25 cm
2 ϕ 12\25 cm
0.4 As2
Sec. (2-2)



Double Cantilever Frame.

$t \simeq \frac{L_c}{5}$ Y

$(0.8 \rightarrow 1.0)\,t$

$L_c = (3 \rightarrow 6)\,m$ $(1 \rightarrow 1.5)\,m$

لا يوجد ترحيل للقواعد

* **Horizontal Beam.**

  Span $(L) = (3.0 \rightarrow 6.0)\ m$

* **Inclined Beam**

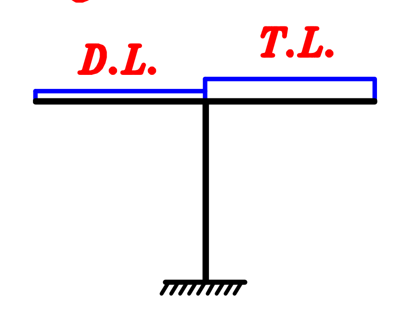
  Span $(L) = (3.0 \rightarrow 8.0)\ m$

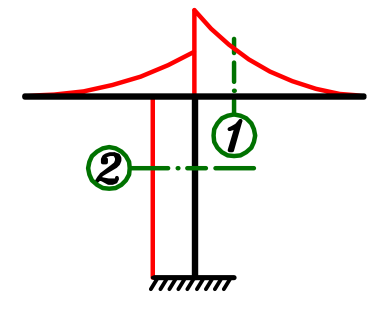
* $t \simeq \dfrac{L}{5}$

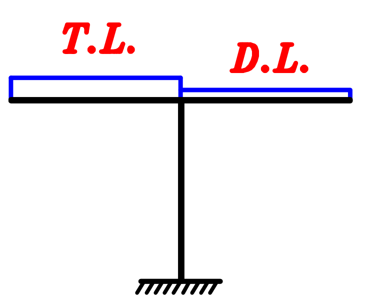
* $b =$ الأكبر $\begin{cases} 0.30\ m \\ \dfrac{Spacing}{20} \end{cases}$

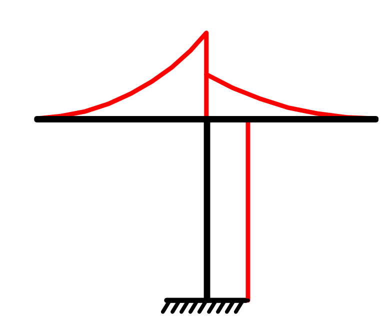
يجب عمل حالات تحميل

– Cases of Loading

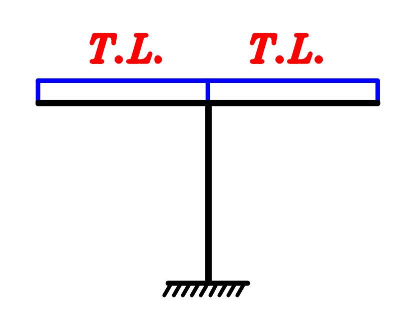


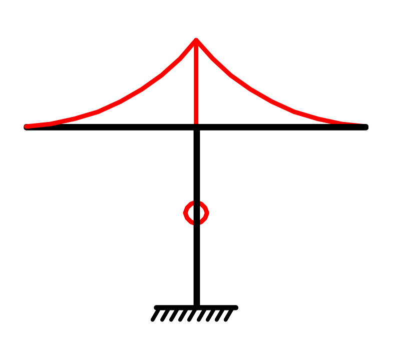


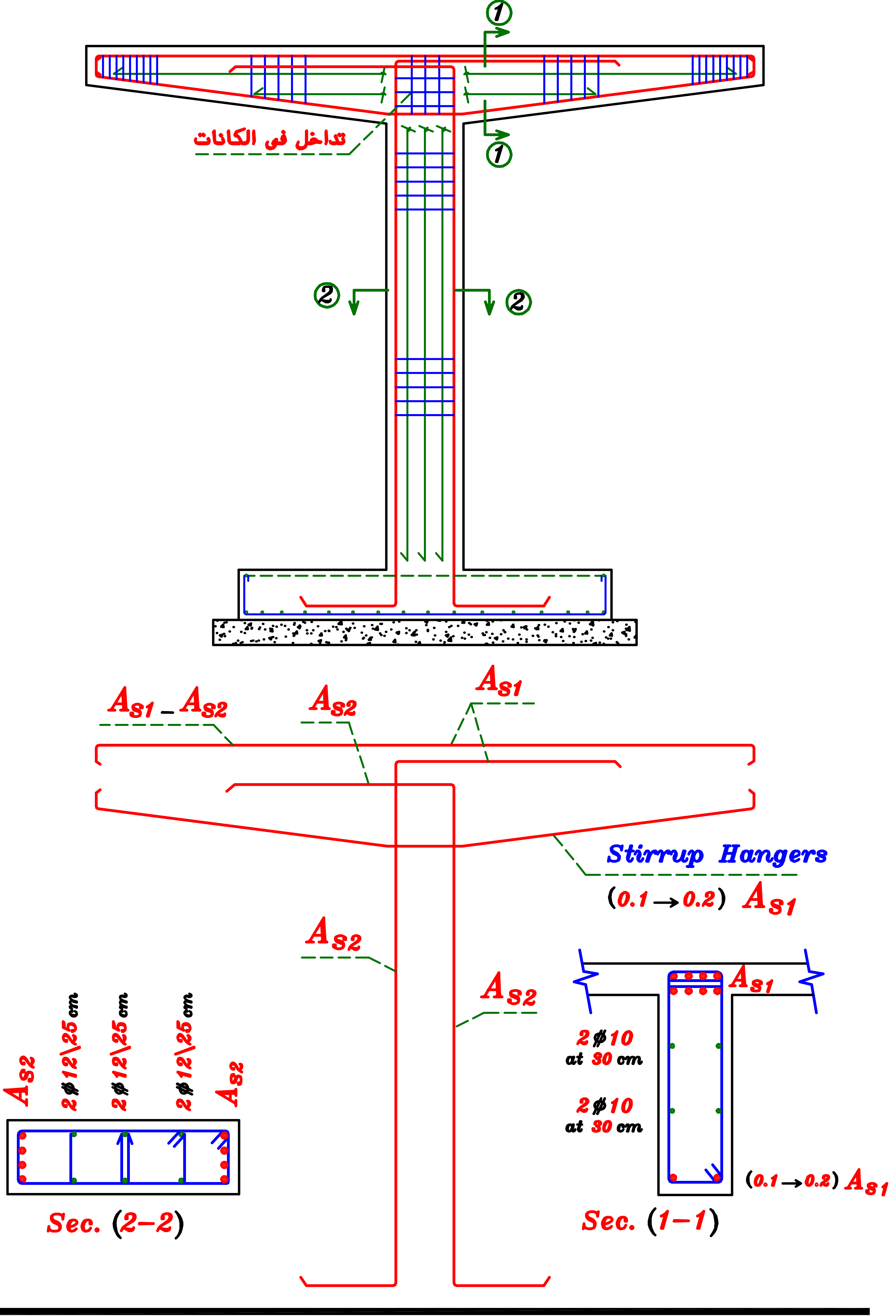




max N.F. on column.



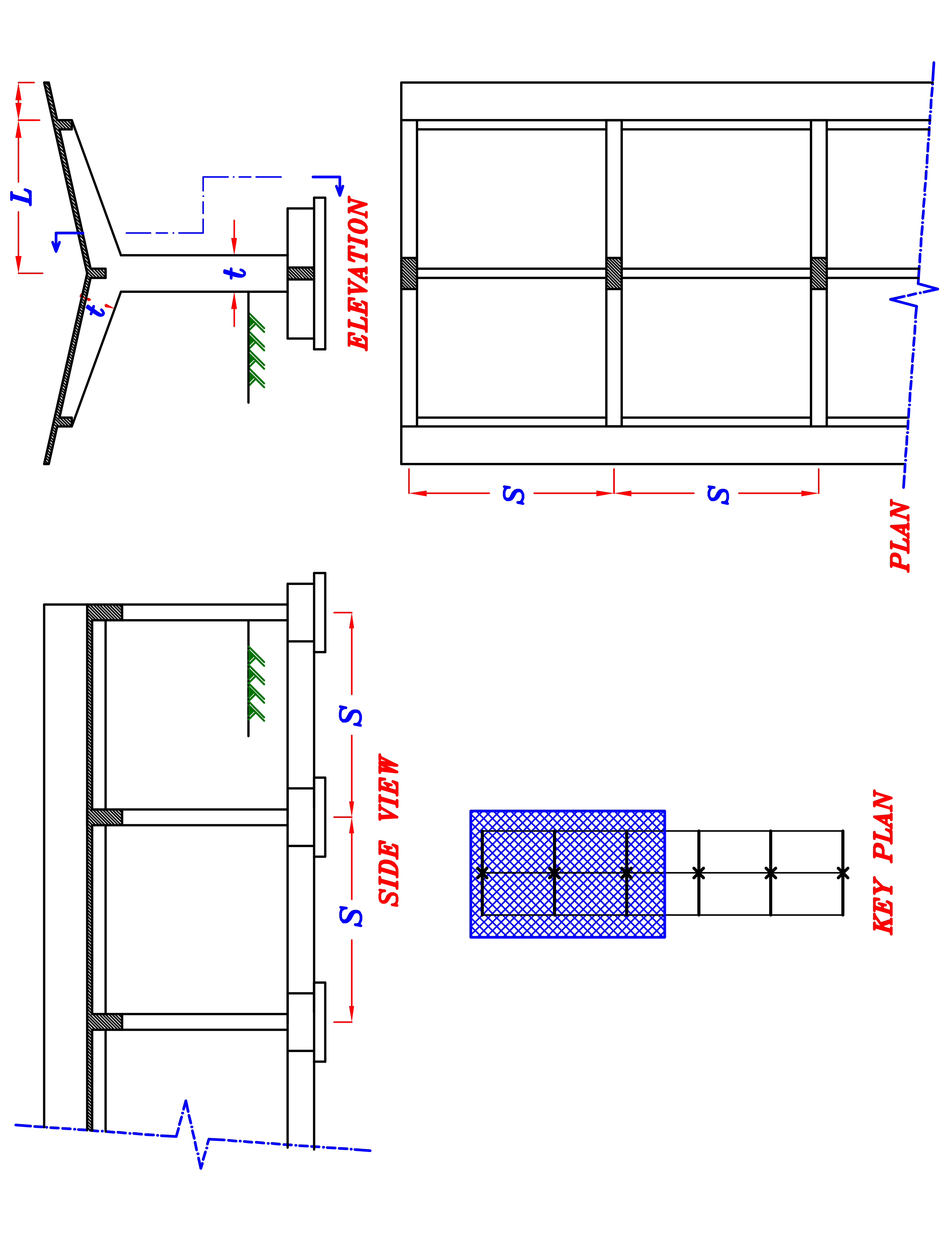


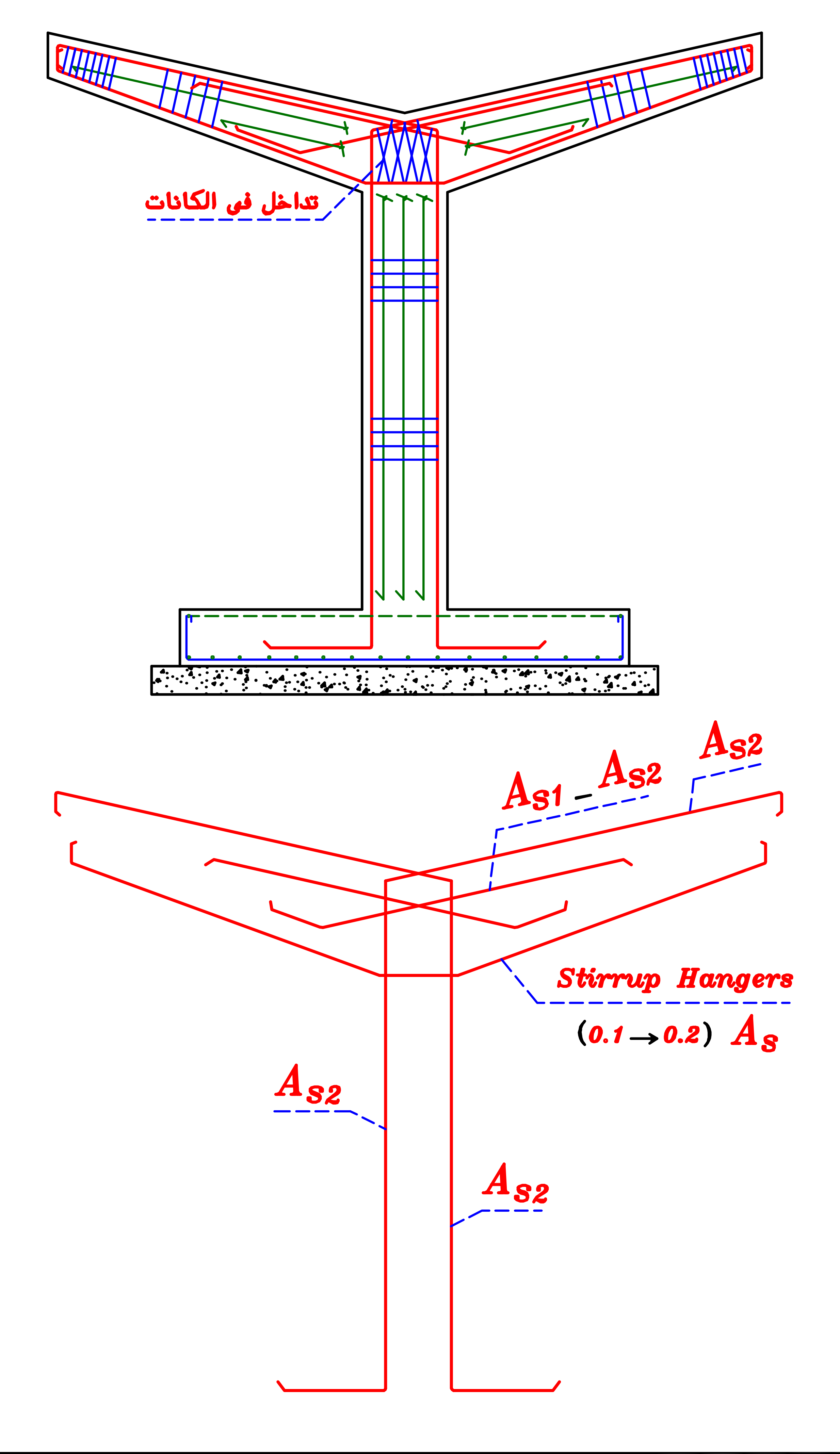


1
1
تداخل فى الكانات
2
2
As1 _ As2
As2
As1
Stirrup Hangers
(0.1 → 0.2) As1
As2
As2
2ϕ12\25 cm
2ϕ12\25 cm
2ϕ12\25 cm
As2
As2
Sec. (2-2)
As1
2ϕ10 at 30 cm
2ϕ10 at 30 cm
(0.1 → 0.2) As1
Sec. (1-1)

– Cases of Loading

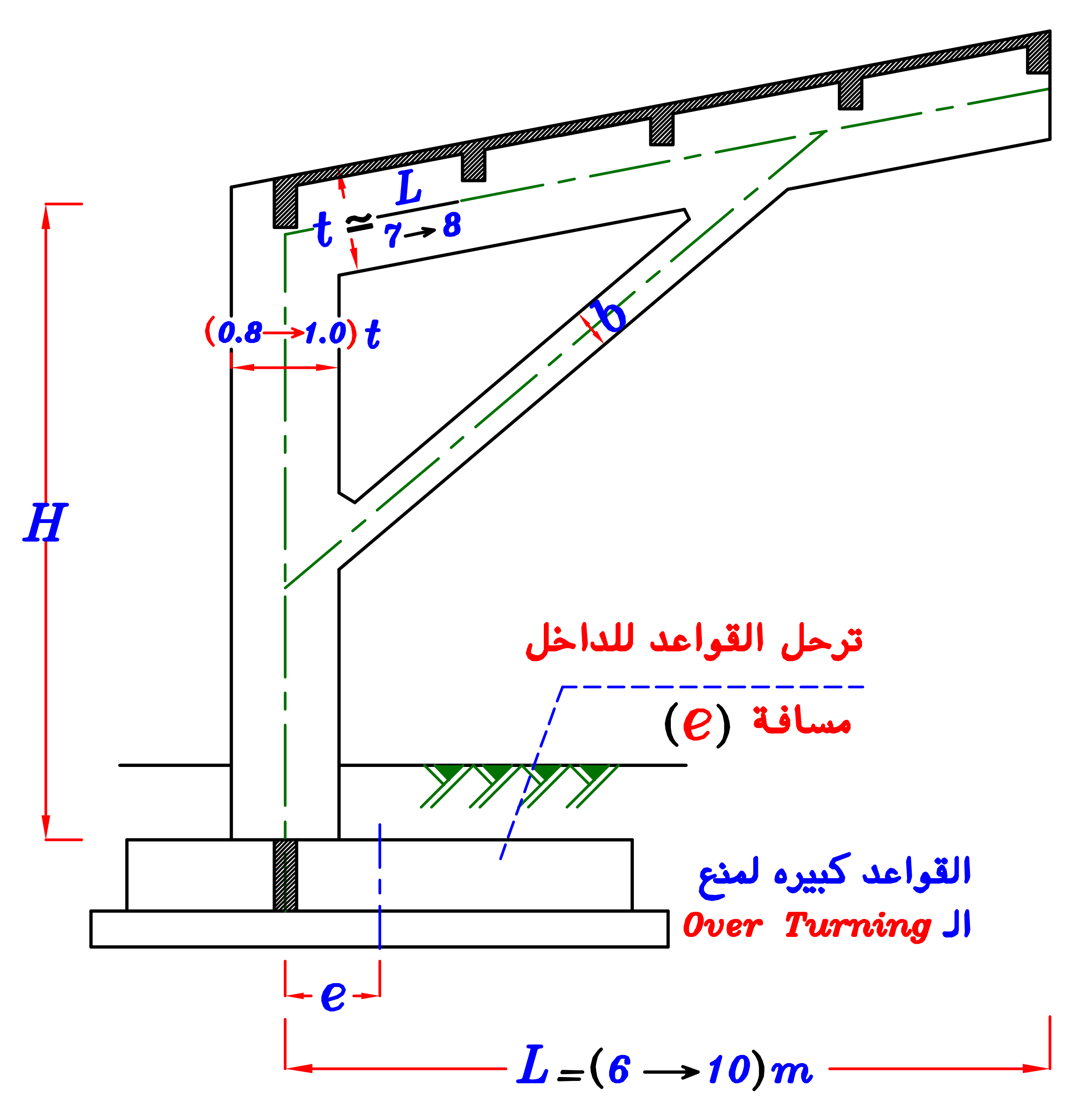
max N.F. on column.


L
t
t'
ELEVATION
S
S
PLAN
S
S
SIDE VIEW
KEY PLAN


تداخل فى الكانات
$A_{s1} - A_{s2}$
A_{s2}
Stirrup Hangers
$(0.1 \rightarrow 0.2)\ A_s$
A_{s2}
A_{s2}

Cantilever Frame

With Compression Link member.



* Span (L) = (6 → 10) m

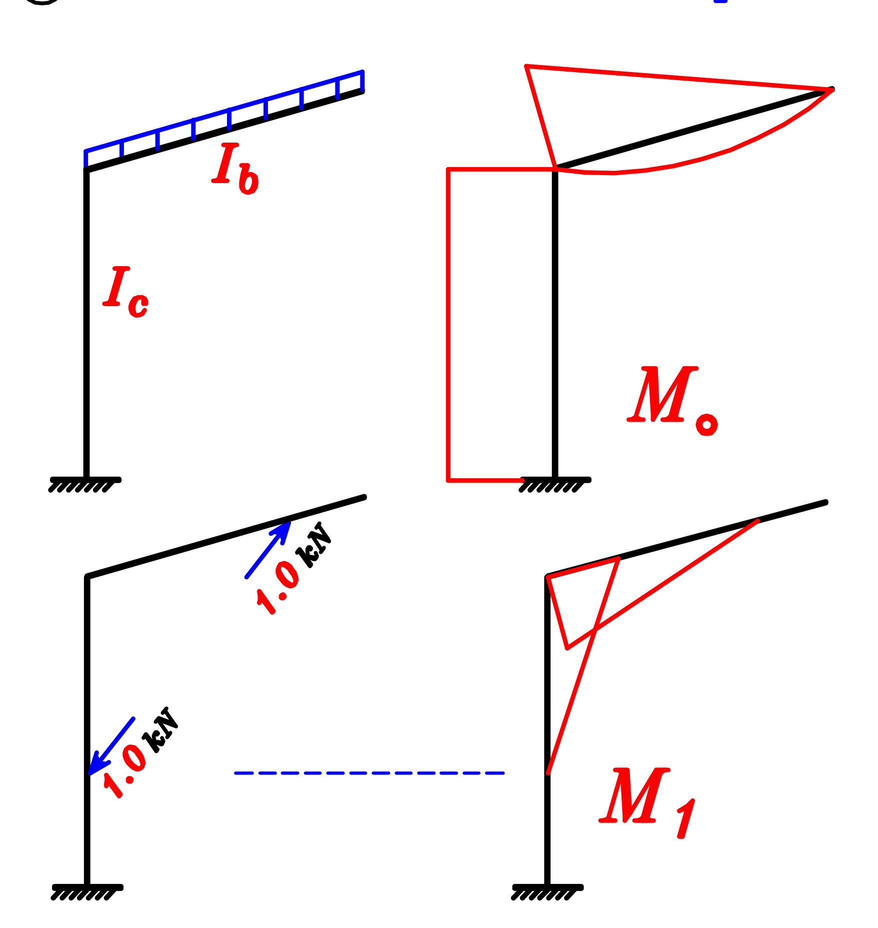
* $t \simeq \frac{L}{7 \rightarrow 8}$

* b = 0.30 m ; $\frac{Spacing}{20}$ } الأكبر

* Link member (b * b)

② IF there is a Link member.

ⓐ IF the Link member is Compression member.



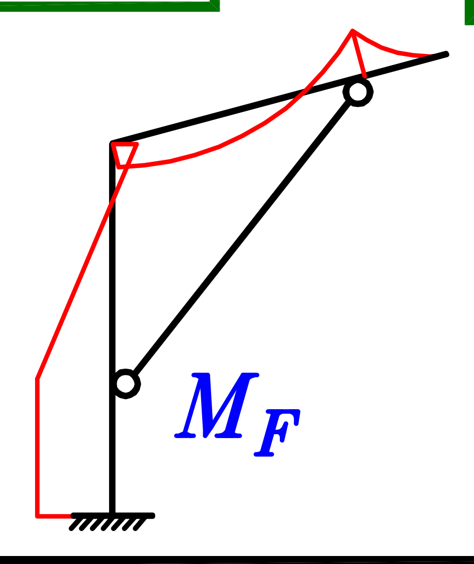
$$\delta_{10} = \frac{1}{E_c I_b} * (M_o * M_1) + \frac{1}{E_c I_c} * (M_o * M_1)$$

$$\delta_{11} = \frac{1}{E_c I_b} * (M_1 * M_1) + \frac{1}{E_c I_c} * (M_1 * M_1)$$

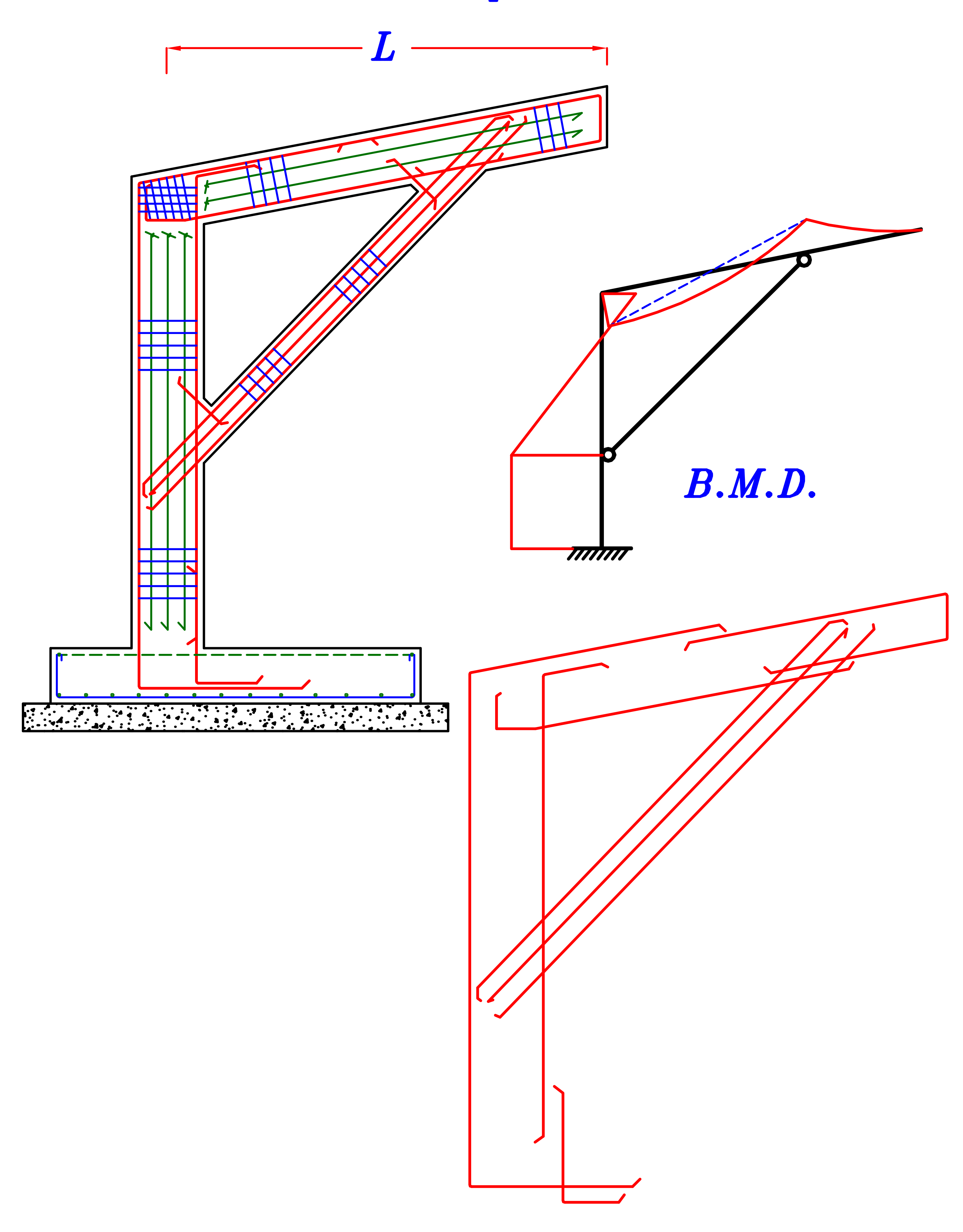
$$\delta_{10} + X\ \delta_{11} = Zero$$

Get X

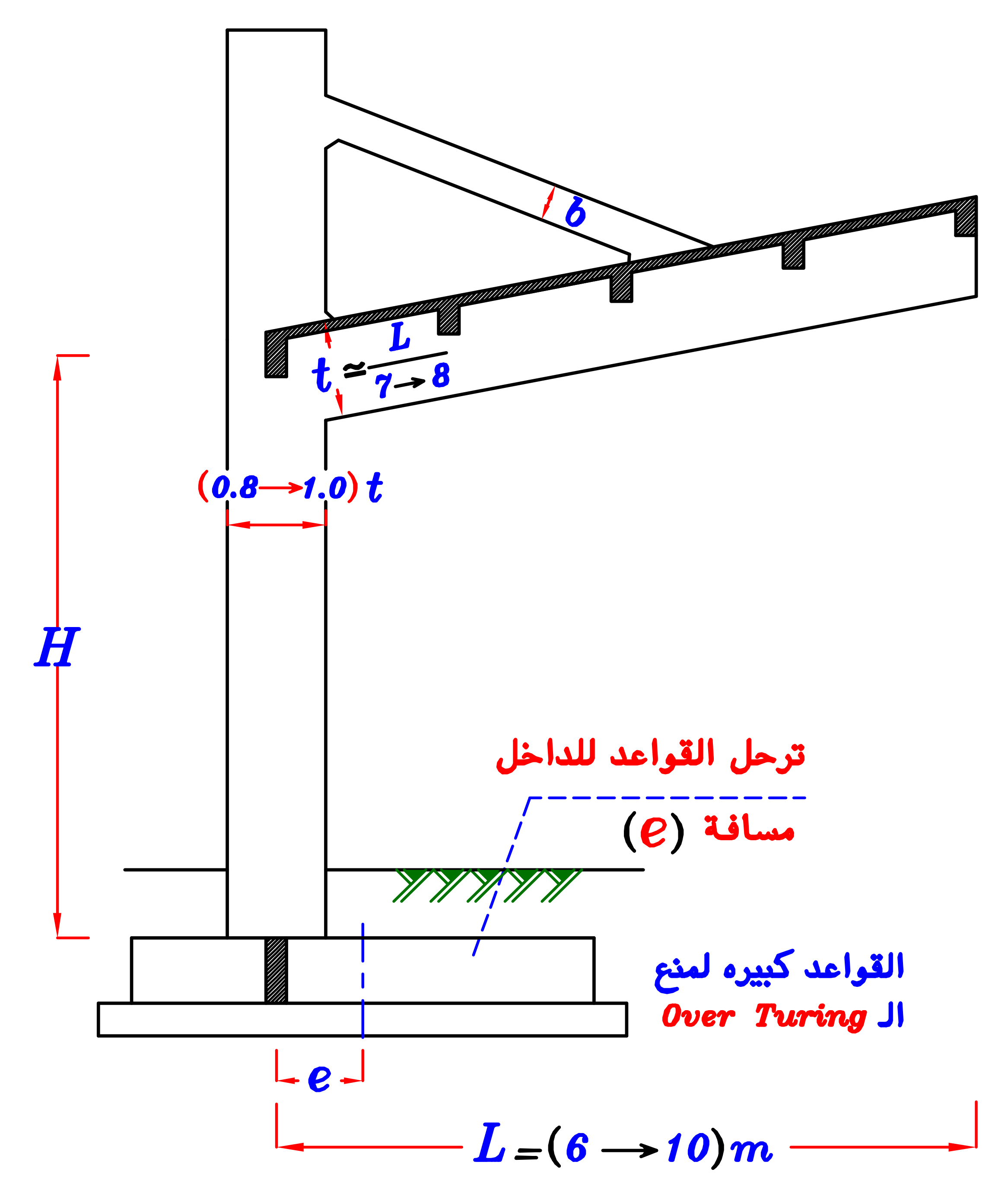
$$M_F = M_o + X\ M_1$$



Cantilever Frame with Compression Link member.



Cantilever Frame
With Tension Link member.



* Span (L) = (6 → 10) m

* $t \simeq \frac{L}{7 \rightarrow 8}$

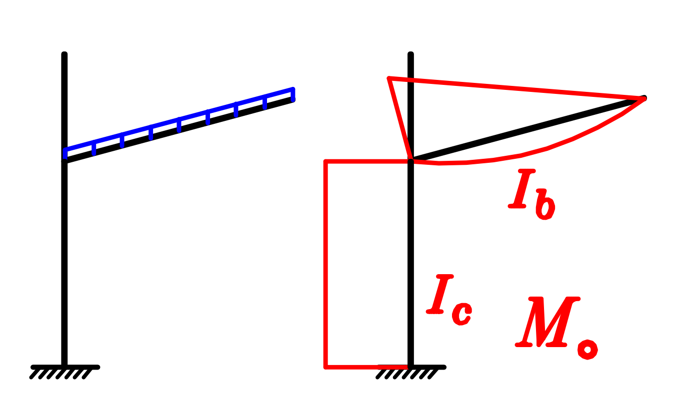
* b = 0.30 m , $\frac{Spacing}{20}$ } الأكبر

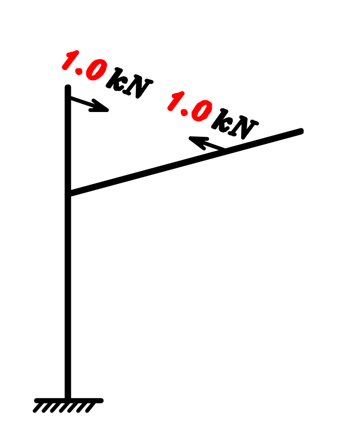
* Link member (b * b)

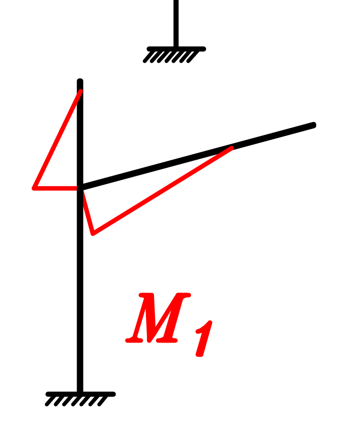
Take the extension of Tie into consideration.

هذه الخطوه ممكن اهمالها للتسهيل

I_b I_c







$$\delta_{10} = \frac{1}{E_c I_b} * (M_o * M_1) + \frac{1}{E_c I_c} * (M_o * M_1)$$

$$\delta_{11} = \frac{1}{E_c I_b} * (M_1 * M_1) + \frac{1}{E_c I_c} * (M_1 * M_1)$$

$$\Delta_{Tie} = \frac{1}{E_c} * \frac{L}{n} * \frac{F_y}{\gamma_s} \ (U.L.) \quad , \quad \Delta_{Tie} = \frac{1}{E_c} * \frac{L}{n} * F_s \ (working)$$

L = Length of the Tie.

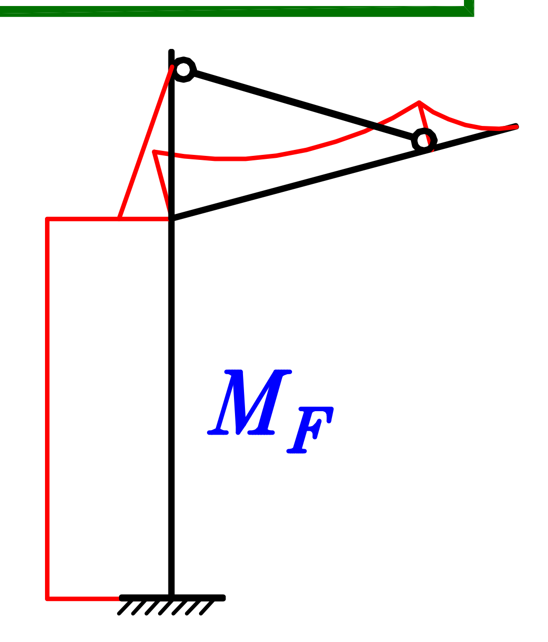
n = modular ratio = 15

$$F_y = 360 \ N\backslash mm^2 = 360 * 10^3 \ kN\backslash m^2$$

$$\delta_{10} + X \ \delta_{11} + \Delta_{Tie} = Zero$$

Get X

$$M_F = M_o + X \ M_1$$



Cantilever Frame with Tension Link member.

